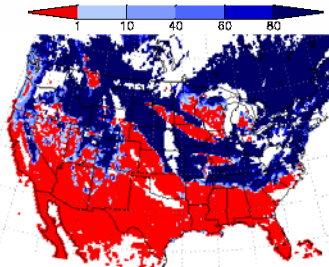




# GLDAS/LIS Assimilation of MODIS Snow Cover

- MODIS snow cover assimilation technique of Rodell and Houser (2004) installed in LIS/Noah
- 2001-present, global,  $1/4^\circ$  GLDAS/Noah assimilation output is publicly available
- Assimilated output from Mosaic and Noah are better than control in both cases, though biases remain
- Assimilated output is continuous and contains more information (SWE) than MODIS (snow cover) alone

MODIS Snow Cover

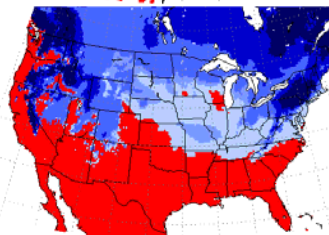
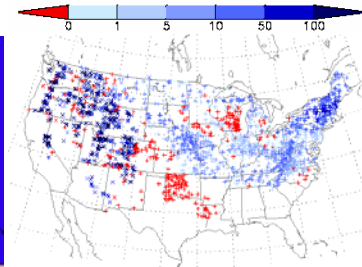


21Z 17 January 2003

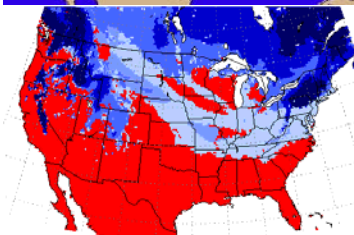
IMS Snow Cover



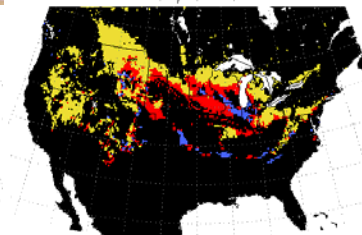
Observed SWE



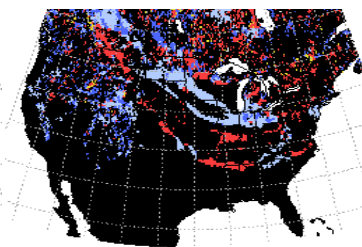
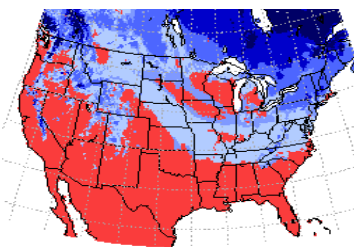
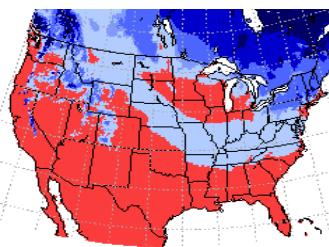
Control Run SWE (mm)



Assimilated SWE (mm)



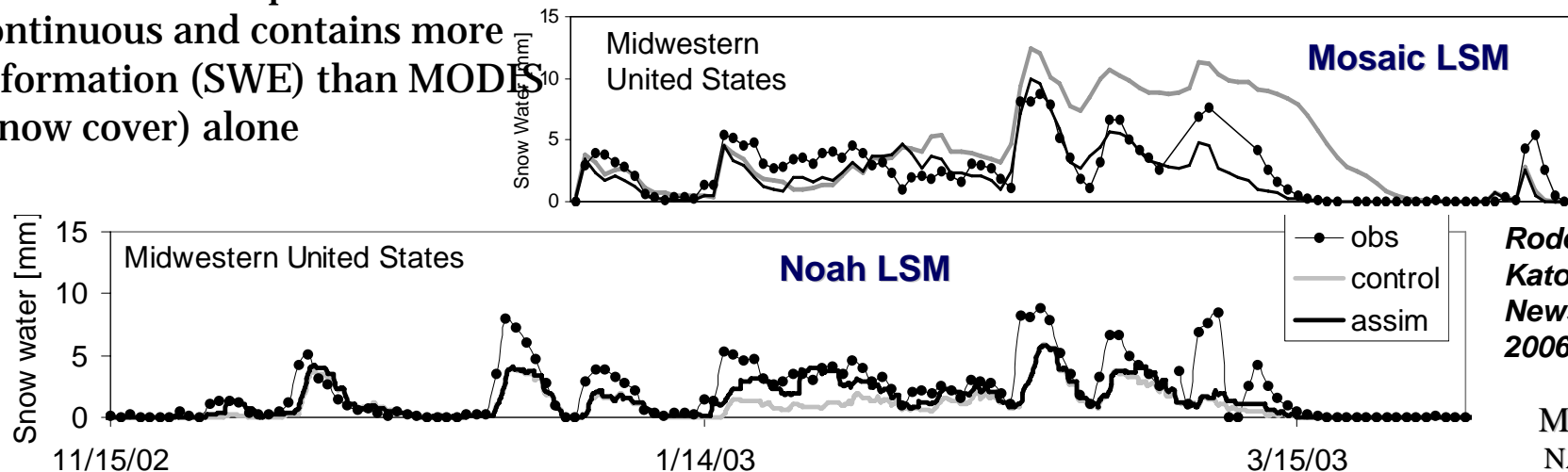
SWE Change (mm)



Observations

Mosaic LSM

Noah LSM



Rodell and  
Kato, CEOP  
Newsletter,  
2006.

Matt Rodell  
NASA GSFC



# Sensitivity of GLDAS/LIS LSMs to Physics, Land Characteristics, and Forcing

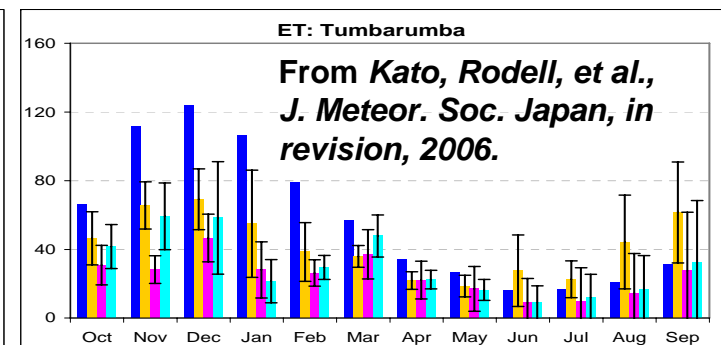
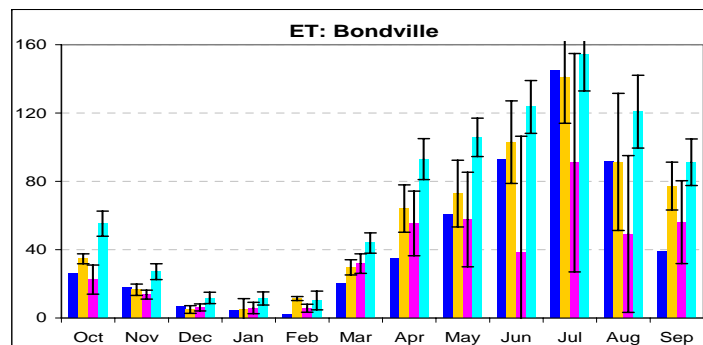
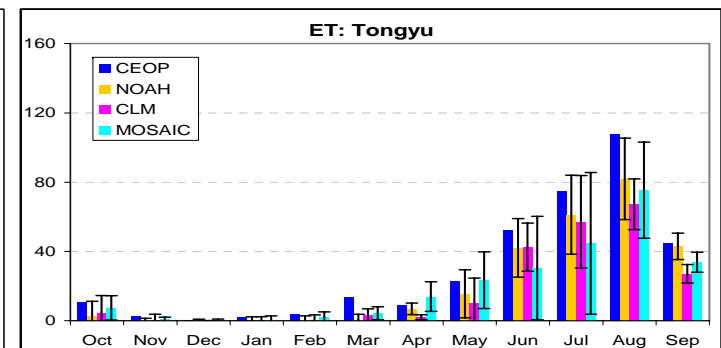
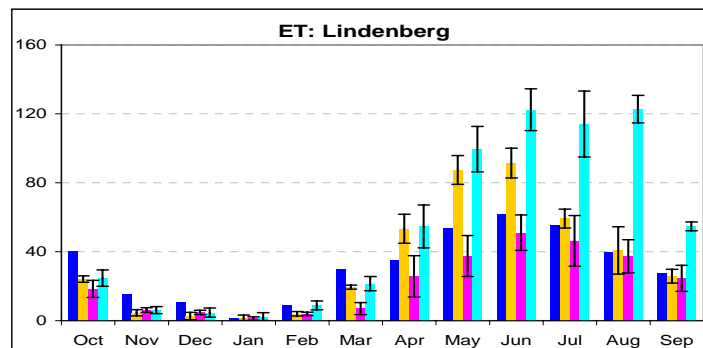
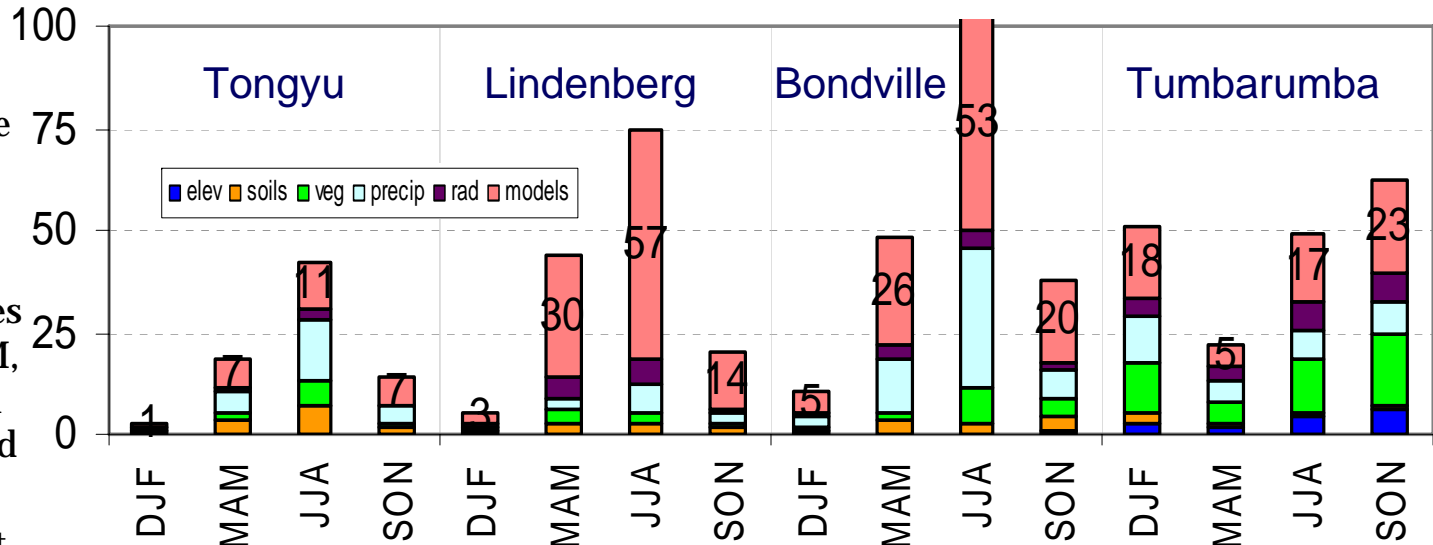


- Control simulations of LIS/Noah, CLM2, and Mosaic forced by CEOP site observations
- Best available global datasets used to test sensitivity of modeled states and fluxes to choice of LSM, precipitation and radiation forcing, elevation, soils, and vegetation
- Choice of LSM has largest impact

- In many cases, observed states and fluxes could not be reproduced no matter which inputs were chosen
- Results emphasize the importance of improving model physics and calibration

**Top: Sensitivity of simulated seasonal ET (mm/month) to 6 runtime options**

**Below: Likely potential ranges of simulated monthly ET (mm/month) compared with CEOP observations**



*From Kato, Rodell, et al.,  
J. Meteor. Soc. Japan, in  
revision, 2006.*



# Incorporation of Satellite Derived Irrigation into GLDAS/LIS

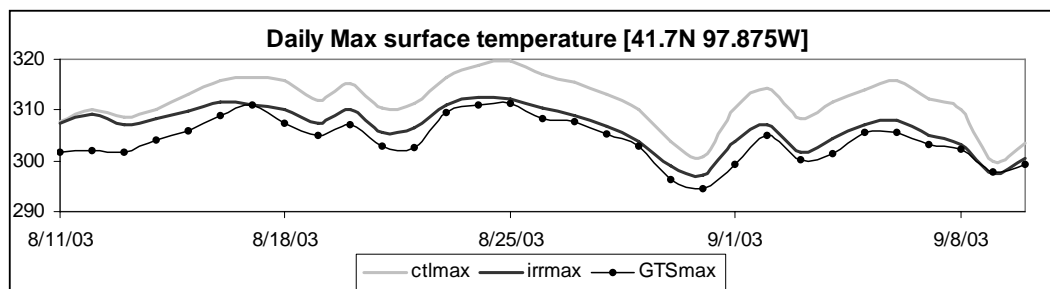
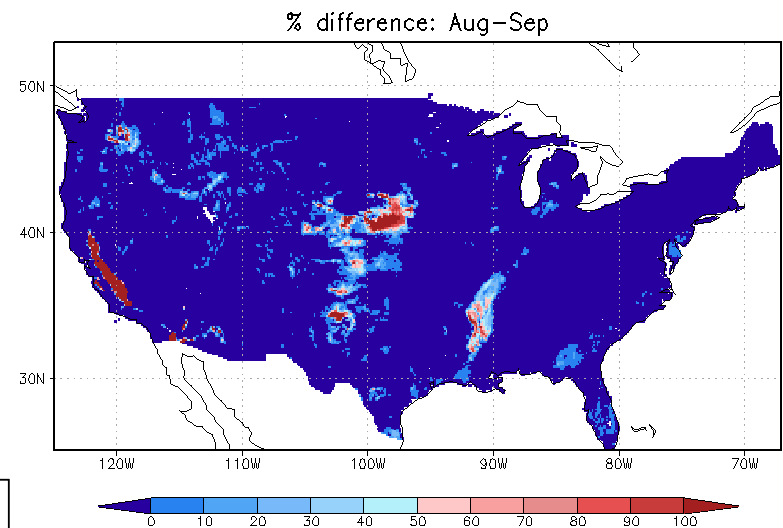
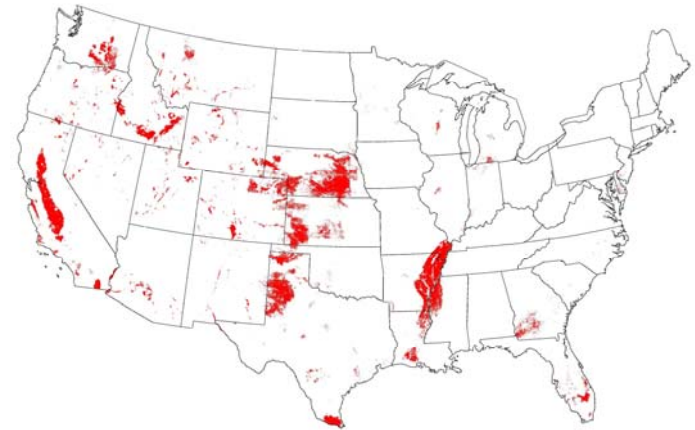


- Extent and intensity of irrigation derived from MODIS satellite observations
- Using a rule based approach with crop type data, irrigation is applied within the Noah land surface model, driven by GLDAS/LIS
- Preliminary results demonstrate that irrigation significantly effects modeled states and fluxes, including soil moisture, surface temperature, and evapotranspiration

**Top right: MODIS derived intensity of irrigation**

**Right: Percentage difference in evapotranspiration between irrigation and control runs, August-September 2003**

**Below: Time series of daily maximum surface temperature (K) at an irrigated location from control run (gray line), irrigation run (black line), and observations (dots)**



*Ozdogan, Rodell, and Kato,  
in preparation.*

Matt Rodell  
NASA GSFC